Claims

[c1] An apparatus for laser material processing comprising:
a work platform for holding a workpiece upon which a laser beam is applied;
a fluid conduit adapted to discharge fluid across the surface of the workpiece; and
a flow control means fluidly coupled to the fluid conduit, the flow control means adapted to regulate the discharge of fluid across the workpiece concurrent with the application of the laser beam.

[c2] The apparatus of claim 1 wherein the fluid discharged across the workpiece is substantially transmissive relative to light emitted from the laser beam.

[c3] The apparatus of claim 2 wherein the fluid is water and laser beam emits light at wavelengths between 190 and 1100 nm.

[c4] The apparatus of claim 1 further comprising:
a propellant conduit adapted to discharge propellant, the propellant conduit fluidly coupled to the fluid conduit; and
a nozzle fluidly coupled to the fluid conduit whereby the fluid is discharged across the workpiece by the propellant.

[c5] The apparatus of claim 4 further comprising an atomizing means for discharging the fluid and propellant together as a spray.

[c6] The apparatus of claim 4 wherein the propellant is substantially transmissive relative to light emitted from the laser beam.

[c7] The apparatus of claim 6 wherein the propellant is nitrogen.

[c8] The apparatus of claim 6 wherein the propellant is helium.

[c9] The apparatus of claim 6 wherein the propellant is argon.

[c10] The apparatus of claim 6 wherein the propellant is carbon dioxide.

[c11] The apparatus of claim 1 further comprising a fluid vacuum adapted to withdraw fluid discharged across the workpiece.

[c12] The apparatus of claim 1 further comprising a computer processor communicatively coupled to the flow control means.

[c13] The apparatus of claim 4 further comprising a computer processor communicatively coupled to the nozzle.

[c14] The apparatus of claim 11 further comprising a computer processor communicatively coupled to the fluid vacuum.

[c15] The apparatus of claim 1 further comprising:
a computer processor communicatively coupled to the flow control means;
a computer readable medium communicatively coupled to the computer processor;
a fluid control module stored on the computer readable medium adapted to stop the discharge of fluid across the workpiece prior to completing a cut-through of the workpiece by the laser beam.

[c16] The apparatus of claim 4 further comprising:
a computer processor communicatively coupled to the flow control means and the propellant conduit;
a computer readable medium communicatively coupled to the computer processor;
a fluid control module stored on the computer readable medium adapted to stop the discharge of fluid across the workpiece by closing off the fluid conduit means and removing residual fluid from the workpiece by opening the propellant conduit prior to completing a cut-through of the workpiece by the laser beam to push residual fluid off the workpiece.

[c17] The apparatus of claim 1 further comprising:
a secondary reservoir holding at least one light-reactive chemical;
a secondary control valve disposed between the secondary reservoir and the fluid conduit whereby activation of the secondary control valve introduces the at least one light-reactive chemical into the fluid conduit.

[c18] The apparatus of claim 1 further comprising a drainage conduit coincident to the workpiece and adapted to recover excess fluid initially discharged across

the workpiece.

[c19] The apparatus of claim 18 wherein the drainage conduit is fluidly coupled to the fluid conduit whereby excess fluid is recirculated.

[c20] The apparatus of claim 19 further comprising a filter disposed in fluid communication between the drainage conduit and fluid conduit.

[c21] An apparatus for laser material processing comprising:
a work platform for holding an workpiece upon which a laser beam is applied; and
a liquid absorbing covering placed over the workpiece, the covering adapted to be cut through by the laser beam.

[c22] A laser material processing method comprising the steps of:
discharging a film of fluid over a workpiece and applying a laser beam to the workpiece.

[c23] The method of claim 22 further comprising the step of preselecting a fluid that is substantially transmissive relative to light emitted from the laser beam.

[c24] The method of claim 23 wherein the preselected fluid is water and the laser beam emits light at wavelengths between 190 and 1100 nm.

[c25] The method of claim 22 further comprising the step of introducing a propellant into the fluid.

[c26] The method of claim 25 further comprising the step of preselecting a propellant that is substantially transmissive relative to light emitted from the laser beam.

[c27] The method of claim 25 wherein the propellant is nitrogen.

[c28] The method of claim 25 wherein the propellant is helium.

[c29] The method of claim 25 wherein the propellant is argon.

[c30] The method of claim 25 wherein the propellant is carbon dioxide.

[c31] The method of claim 22 further comprising the step of withdrawing excess fluid

discharged across the workpiece.

[c32] The method of claim 22 further comprising the step of providing a computer processor adapted to control the discharge of fluid across the workpiece.

[c33] The method of claim 31 further comprising the step of providing a computer processor adapted to control the withdraw of excess fluid from the workpiece.

[c34] The method of claim 22 further comprising the step of ceasing the discharge of fluid across the workpiece prior to the laser beam completing a cut-through of the workpiece.

[c35] The method of claim 34 further comprising the step of pushing residual liquid from the workpiece by propellant injection prior to the laser beam completing a cut-through of the workpiece.

[c36] The method of claim 22 further comprising the step of introducing at least one light-reactive chemical onto the workpiece.